

THE MINERAL INDUSTRY OF MOZAMBIQUE

By Bernadette Michalski

Mozambique hosts a significant quantity of metallic and nonmetallic minerals, but few deposits have been developed other than on a small scale. The Nation's first full year as a democratic government fostered expectations of long-term stability and security resulting in increased foreign investment in the country. A great deal of exploration interest was shown, particularly by South African and Canadian firms, for gold and gemstones. Twelve licenses were granted for exploration and mining in 1995. A graphite mine was inaugurated at midyear, and a rehabilitated marble quarry and cutting factory was in full operation. Three titaniferous sand projects were underway. Agreements were signed for the development of a natural gas field, and large coal resources were being evaluated. A feasibility study on an iron ore reduction plant near Manica was launched. A feasibility study was undertaken for a 200,000-metric-ton-per-year (t/yr) capacity aluminum smelter. A gold rush by artisanal miners was underway in the north of the country, an area not hitherto considered as having much gold potential. The only significant production of processed or secondary minerals was of cement.

Government estimates of smuggled gold were on the order of 4,000 kilograms (kg) to 5,000 kg or about \$50 million to \$62 million¹. For gemstones, the Government estimated the value of smuggled stones at up to \$50 million per year. An upsurge of illegal mining was expected as refugees returned to their homeland.

Mozambique's ports and railways, now significantly rehabilitated, traditionally have been major components of the trade infrastructure of southern Africa. The transshipment of goods, particularly minerals, to and from the country's inland neighbors has been an important source of foreign exchange for Mozambique, averaging about \$25 million annually in recent years. About one-third of these revenues was believed to have been from mineral commodities.

Wages in the mineral sector were estimated by the Government to have totaled about \$5 million; however, wages earned by almost 50,000 Mozambique workers employed by mines in South Africa were far more significant. Based on data from the South African Chamber of Mines, officially repatriated wages from these miners likely totaled about \$50 million, with a similar amount unofficially repatriated.

Mozambique has a wide variety of mineral deposits, many of which occur in Precambrian granitic terrane in the northern

one-half of the country. A very large, world-famous pegmatite field occurring near Alto Ligonha and Nampula continues to produce a variety of gemstones and has produced tantalum minerals with associated subordinate niobium (columbium), antimony, bismuth, kaolin, lithium, and rare-earths. Granitic gneisses in northern Mozambique host graphite deposits, and metasedimentary inliers to this crystalline terrane host some deposits of marble and garnet—the latter are mined from alluvial deposits. Near the Tanzania border along Lake Nyasa is a greenstone belt from which gold was being mined on an artisanal basis. Metasedimentary rocks near Manica host strata-bound and vein gold deposits and some copper deposits. Gold mineralization areas are found in two main regions—Manica and Tete. The Manica region is believed to be a continuation of the Mutare Goldfield in Zimbabwe. Ashanti Gold of Ghana applied for a license to mine in Manica. Other companies involved in gold mining in Mozambique include International Gold of Australia, Lonrho, Kenmare Resources, Plc. of Ireland, Benecon Earthworks and Mining (Pty.) Ltd. of South Africa, and Mincor of Mozambique. Kenmare reports finding at least 14 veins of more than 1 meter in width in the Naissa Province. Benecon was exploiting alluvial resources at about 10 kg per month. The gold is smelted in Zimbabwe. Gencor Ltd. and African Mining and Trust, both of South Africa, are active in the Zambezia Province. Small gold deposits continued to be mined particularly in the northern sector. The Mozambique mining authorities estimate that more than 30,000 foreigners from neighboring countries are illegally mining for artisanal gold along Mozambique's borders in the Manica and Tete Provinces. Some gemstone and gold deposits are known near Tete, but coal, which occurs in Permian (Karoo) rocks, is the major mineral resource of the Tete area. Quaternary sands along the Indian Ocean coast north of Quelimane host large deposits of titaniferous minerals (ilmenite and rutile), zircon, and monazite, derived from the Precambrian granitic hinterland. The southern half of the country is dominated by Cretaceous and younger sedimentary rocks. These host a number of deposits of industrial minerals, especially clays and diatomite, and limestone suitable for cement. The coastal area near Beira has structural basins which host significant reserves of natural gas.

The Government, seeking to increase foreign investment, was revising mining and related investment laws accordingly.

The mining law is based on law No. 2/86 of April 16, 1986, as amended by law No. 5/94 of September 18, 1994, and as modified by the mining law regulations, Decree No. 13/87 of February 24, 1987, and Decree No. 53/94 of November 9, 1994. Petroleum and natural gas exploration and exploitation were governed by law No. 3/81 of October 3, 1981.

An environmental impact assessment is required for all projects at the predevelopment stage. Monitoring and enforcement are the responsibility of the Ministry for the Environment.

The production of most mineral commodities increased in 1995. (See *Table 1*.) The output of gemstones was mixed but, as with gold, significantly under-represented true production because of widespread smuggling. The Government estimated that at least 13 tons of gold has been illegally mined in the Niassa Province between 1991 and 1995.

Few trade data were available for 1995. Official exports of goods were reported at about \$165 million. Minerals accounted for about 2% of this total, excluding smuggled material. Formal exports were dominated by bauxite, gemstones, gold, and marble. Exports to the United States exceeded \$15 million but only about 1% in mineral commodities. Transshipments from neighboring countries included asbestos, coal, and ferrochromium, from South Africa and Zimbabwe, copper from Zambia, and granite from Zimbabwe. The ports were Maputo-Matola and Beira; Matola's coal terminal was the most important facility handling close to a million tons of coal annually. African Portland Industrial Holdings was negotiating for the purchase of 95% equity in the Matola Coal Terminal. Annually, about 8.5 million barrels of refined petroleum products is offloaded at Beira for transshipment by pipeline to Zimbabwe.

The Marmonte Co. of Italy is active in marble mining in Mozambique. All marble extracted by the company is exported to Italy.

Gencor Ltd. and Edlow Resources have completed a prefeasibility study in the Moebase—Moma, Nampula titaniferous sands deposit. The study was based on the production of a concentrate of 900,000 t/yr to produce titanium slag at a level of 400,000 t/yr. Heavy minerals are expected to comprise some 78% of the concentrate with ilmenite contributing 72% and zircon and rutile together contributing 6%. Gencor continued reserve delineation drilling at the Pebane titaniferous sand concession, as part of an earn-in agreement with Edlow Resources Ltd. of the United States.

BHP International Minerals of Australia had an option from Kenmare Resources Plc. of Ireland to acquire up to a 75% equity stake in the Congolone titaniferous sands concession near Angoche. Reserves earlier delineated by Kenmare were reported by the company as 166 million metric tons (Mt) grading 3.4% heavy minerals, mostly ilmenite, plus an inferred resource of 750 Mt. According to

Kenmare, BHP was seeking to increase proven reserves to justify a titania slag plant; slag was viewed as being more marketable than the heavy mineral concentrates envisioned by Kenmare. Although prospects for the successful mining of heavy mineral sands are good, environmental issues could be a major challenge. The need to spur economic growth, provide foreign exchange income, and increased tax revenue could outweigh these concerns.

Mozambique had two formal operating gold mines. The Chua placer gold mine near Manica was operated by the South African company, Benicon Earthworks & Mining (Pty.) Ltd. Mincor Resources Inc. of Canada operated the Monarch Mine, near Manica. Unregulated artisanal mining occurred to a modest degree in the Manica and Tete areas and to a much greater degree in Niassa Province near the Tanzania border. Manica, Niassa, and Tete areas were being targeted for exploration by a number of international companies including Kenmare Resources.

The Ancuabe graphite mine north of Montepuez was declared in commercial production by July 1995. The operating company was Grafites de Ancuabe S.A.R.L., a joint venture among Kenmare Resources Plc. of Ireland, 65%; the Government, 25%; and the United Kingdom's Commonwealth Development Corp., 10%. According to Kenmare, the mine's plant had an annual capacity of 10,000 metric tons (t) of a coarse flake graphite concentrate grading more than 98% carbon. Production in 1995 was hampered due to problems with electric power that required changes in the milling system. Most of the production is exported to Canada, Germany, Japan, and the United States for the production of refractories. Kenmare reported reserves of about 24 Mt of ore grading from 3% to 11% graphite.

Most formal mining of gemstones was by Hagura Mining Mozambique Ltd., an Israeli-owned company, which operated a garnet mine near Cuamba and the Niame and Maria III emerald mines near Alto Ligonha. The company also bought gemstones from artisanal miners, as did the state-owned or parastatal cutting agency Gemas e Pedras Lapidadas. The parastatal Companhia de Desenvolvimento Mineiro, S.A.R.L., mined some dumortierite near Tete.

Mozambique's three cement plants, Matola, Dondo, and Nampula are operated by Cementos de Mozambique. The Matola and Dondo plants were undergoing rehabilitation but were capable of grinding clinker.

In terms of mineral fuels, Mozambique's largest resources are those of the Moatize-Minjov Coal Basin near Tete. A feasibility study by Brazil's Companhia Vale do Rio Doce established that Moatize-Minjov's reserves were adequate to support a long-term annual coal output of 22 Mmt, of which 9 Mmt would be salable annually, but that extensive new mine, railing and port coal-loading infrastructure would be required.

Considerable interest was expressed by foreign companies in developing the Pande natural gas field near Beira. The Government had signed a development agreement with Enron

Development Corp. of the United States. Plans include the piping of natural gas to South Africa, and possibly Maputo, for sale. According to the Government, proven reserves at Pande were about 55 million cubic meters.

Large-scale investment in Mozambique's mining sector is dependent on political developments, including the perception of long-term improved security conditions. Likely developments are for the country to become a significant producer of titanium minerals and possibly natural gas, and a modest producer of gemstones, gold, and graphite. The Government was attempting to improve its buying methodologies for gold and gemstones to reduce smuggling.

According to the Ministry of Mineral Resources and Energy, reserve data include coal, 9.75 billion metric tons; copper, 232,000t; fluorite, 1.45 Mt; iron ore, 254 Mt; and titanium ore, 348 Mt.

If the ongoing negotiations to restore significant electrical generation at the 2,400-megawatt Cahora Bassa hydroelectric plant reach fruition, Mozambique stands to earn significant revenues from electricity sales to South Africa and Zimbabwe by 1997. There is potential, too, for hydroelectricity to be available for developing industries such as the proposed aluminum smelter. Development is hindered by the inaccessibility of many deposits requiring heavy investments in infrastructure.

¹Where necessary, values have been converted from Mozambique meticaais (M) to U.S. dollars at the rate of M6,039=US\$1.00.

Major Sources Of Information

Ministry of Mineral Resources and Energy

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TABLE 1
MOZAMBIQUE: PRODUCTION OF MINERAL COMMODITIES 1/
(Metric tons unless otherwise specified)

Commodity 2/	1991	1992	1993	1994	1995 e/
Bauxite	7,760	8,340	6,000	9,620	10,700
Cement, hydraulic e/	80	30	20	20	30
thousand tons					
Clays, bentonite	664	20	100 e/	3,350	3,500
Coal, bituminous	50,832	48,000 r/	48,400 r/	58,190 r/	60,610
Copper:					
Concentrate:					
Gross weight	--	--	--	1,240	--
Cu content e/	--	--	--	259	--
Gemstones, Semiprecious					
Cut stones, all types	12,900	8,450	7,690	6,450	6,000
carats					
Rough stones e/ 3/	1,350	750	560	7,000	8,000
kilograms					
Gold 4/	394	296	149	336	350
do.					
Graphite, concentrates	--	--	10	430	3,000
Marble:					
Block	279	919	1,380	1,500	1,500
cubic meters					
Slab	--	--	34	52,300	52,300
square meters					
Salt, marine e/	30,000 r/	30,000 r/	35,000 r/	40,000	40,000
Tantalum, microlite concentrates	266	--	--	--	--
kilograms					

e/ Estimated. r/ Revised.

1/Data available through June 15, 1997.

2/In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (other clays, sand and gravel, and stone) presumably are produced, as is a small amount of natural gas. For these commodities, output is not reported quantitatively and information is insufficient to make reliable estimates.

3/Artisanal production of rough gemstones include in order of importance, tourmaline, garnet, dumortierite, aquamarine, emerald and morganite.

4/Does not include artisanal gold, for which there were no data, but which the Government has estimated at about 4,000 kilograms per year.